MODEL 210 A.C. and 210U A.C./D.C.

SERVICE DATA SHEET No. 1 (amended)

CIRCUIT DESCRIPTION

VALVES IN BOTH RECEIVERS

M.210 A.C. only

ECH81 frequency Changer. EF41 Intermediate frequency amplifier. EBC41 second detector, AVC, 1st LF Amplifier. EL84 output pentode. EZ80 full wave rectifier.

M.210 A.C./D.C.

Valves carry out the same duty as the A.C. Model except the rectifier which is UY41 half wave rectifier. Signal and output stages use UCH42, UF41, UBC41, UL41.

GENERAL DESCRIPTION

A three wave band superheterodyne receiver using 5 valves.

Signals are transferred from aerial to frequency changer grid via L1, L2 on short waves ; L3, L4, L5 on medium waves ; L6, L7, L8 on long waves. The operation of these circuits is as follows :

SHORT WAVE

The aerial is coupled to tuned winding L2 by inductive coupling from primary coil L1, L2 is trimmed by C3.

MEDIUM WAVES

The aerial is coupled to tuned winding L5 by inductive coupling from primary coil L4 and common shunt capacity C7. These two couplings are in opposition and are arranged to cancel at the intermediate frequency to give I.F. rejection. Second channel rejection is secured at the low frequency end of the Band by a tap on L5. The top part of L5 and the tuning capacitor form a series tuned acceptor circuit to attenuate the image frequency. At the high frequency end of the Band, second channel rejection is by capacitor C2, which cancels inductive coupling from L4 and L5 at image frequency. This capacitor C2 has no appreciable effect at signal frequencies. L3 and C1 form a low pass filter to attenuate short wave transmissions which may cause interference.

Resistor R2 damps the aerial circuit and ensures even sensitivity and minimum misganging in spite of varying aerial characteristics, trimming of L5 is by C4.

LONG WAVE

The aerial is coupled to tuned winding L8 by inductive coupling from primary coil L7 and shunt capacitor C7. The two methods of coupling aiding each other. L6 is a self-resonant coil to attenuate image frequencies. R1 serves to damp aerial circuit resonance and to reduce susceptibility to modulation hum, trimming by C5.

MIXER STAGE

The triode section of the frequency changer is used as a local oscillator in a tuned anode circuit. R7 is used as a grid stopper to prevent squegging on the short wave band and to level out oscillator voltage over the other wave bands. Trimming of the oscillator circuit is by C14 on the short wave band. Padding by C18 on medium wave band and C21 on long waves. Frequency changer grid and oscillator anode are effectively earthed on gram. Automatic gain control voltage is applied to the frequency changer grid via R20 and R5. The I.F. grid is fed from the junction of these two resistors. The F.C. Screen is fed from a potential divider R3, R4 to improve the A.V.C. characteristics.

INTERMEDIATE FREQUENCY AMPLIFIER

I.F. amplification is carried out by two high "Q" permeability tuned transformers. Voltage for the A.V.C. system is taken from the 2nd I.F. transformer secondary via C27. The detector diode is fed from the same winding with diode load R13, R14, R15 in series, R13, C30, C31 form the filter network to filter out the intermediate frequency voltages from the radiogram switch wiring to prevent instability. R14, C32 filter out the oscillator voltage which tends to be transferred to the gram switch wiring due to the compactness of the coil unit.

continued over

SECOND DETECTOR AND OUTPUT STAGE

A.F. voltage from the anode of the second detector is fed to the grid of the output valve via C36, R21, R26 in series. R26 being a grid stopper to prevent spurious oscillations and remove any residual I.F. voltages. The tone control network consists of R21, R22, R23, R24, C37, C38. Automatic Bias for the Output Valve is provided by R27 bypassed by C39.

SPEAKER

The low impedance loudspeaker is matched to the output valve by transformer T1. C40 is the anode bypass, and fixed tone control capacitor.

POWER SUPPLY AND H.T. SMOOTHING M.210 A.C.

H.T. is supplied by transformer T2 and full wave rectification using EZ80 valve. The reservoir capacitor is C43. Output valve anode supply smoothing by R29, C42. Main H.T. line smoothing by R28, C41. The rectifier heater is supplied by separate winding on the transformer, an electrostatic screen is provided between primary and secondaries to eliminate modulation hum. The primary is a tapped winding to permit use with voltages 195—250 V A.C. inclusive. Scale lighting, with 2 bulbs at 6·5 V ·3 amp fed by separate 5 V winding.

POWER SUPPLY AND H.T. SMOOTHING M.210U A.C./D.C.

The H.T. is supplied by half wave rectifier UY41 with reservoir capacitor C43. Output valve anode smoothing by R29, C42. R29 being chosen to prevent excessive loss of voltage whilst retaining adequate smoothing ability. Smoothing for the main H.T. line is by R28, C41.

The heaters of the valves are in series through the tapped mains dropper R30.

The resistor includes a 100 ohm section used as a surge limiter for the anode of the rectifier. The tappings permit input voltages of 195—255 inclusive. Dial bulbs are in series shunted by R31.

COILS

WITH D.C. RESISTANCE VALUES

No.	DESCRIPTION	Ohms
L1	S.W. Aer. Coupling Coil	Very low
L2	S.W. Grid Coil	Very low
L3	M.W. Rejection Coil	8
L4	M.W. Aer. Coupling Coil	6
L5	M.W. Grid Coil	3·5
L6	L.W. Rejector Coil	33
L7	L.W. Aer. Coupling Coil	4
L8	L.W. Grid Coil	37
L9	S.W. Osc. Grid Coil	Very low
L10	S.W. Osc. Anode Coil	Very low
L11	L.W. Osc. Grid Coil	1·5
L12	M.W. Osc. Anode Coil	5·7
L13	L.W. Osc. Grid Coil	2·5
L14	L.W. Osc. Anode Coil	14
L15	Primary 1st I.F. Transformer	4·8
L16	Secondary 1st I.F. Transformer	
L17	Primary 2nd I.F. Transformer	
L18	Secondary 2nd I.F. Transformer	
T1	L.S. Output Transformer M.210	Pri. 500
T1	L.S. Output Transformer M.210U	Pri. 350
T2	Mains Transformer	Total Pri. 23 Total H.T. Sec. 300
	Loudspeaker	Speech Coil 3

CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

Signal Generator.
Insulated Trimming Tool.
A.C. Volt Meter across speech Coil terminals.
6 B.A. Box Spanner.

I.F. STAGES 470 KC/S

1. Switch to M.W., Volume control to maximum, tuning gang fully meshed.
2. Screw out all cores of I.F. transformers until the cores are flush with the ends of the cans.
3. Connect the signal generator output lead to the control grid of the frequency changer Valve, and inject 470 KC/S.
4. Adjust cores for maximum output in the following order:
   1. Top core 2nd I.F. Transformer.
   2. Bottom core 2nd I.F. Transformer.
   3. Top core 1st I.F. Transformer.
   4. Bottom core 1st I.F. Transformer.

   As circuits come into line reduce signal generator output to prevent the A.V.C. circuits operating.

SIGNAL CIRCUIT

1. Connect signal generator to the "A" and "E" sockets using the artificial aerial.
2. With the gang fully meshed adjust the pointer to coincide with the "DOT" at the right Hand end of the L.W. Scale.
3. Switch to short waves, set the pointer to 17 metres and inject a signal of 17·6 MC/S, tune in the signal with Oscillator Trimmer C14. Adjust aerial circuit with C3 for maximum response.
4. Switch to "MW.', set pointer to 200 metres, inject a signal of 1500 KC/S. Tune the signal with oscillator C15. Adjust aerial circuit with C4 for maximum output.
5. Set pointer to 500 Metres and inject a signal of 600 KC/S. Tune for Maximum output with C18 whilst rocking the gang, check that this coincides with 500 metres on the scale. Repeat 4 and 5 until no improvement can be made.
6. Switch to "L.W.", set pointer to 1000 metres and inject a signal of 300 KC/S. Tune with the L.W. oscillator trimmer C16, then tune aerial circuit for maximum response with C5.
7. Set Pointer to 2000 Metres and inject a signal of 150 KC/S. Tune with L.W. oscillator Padder C21 whilst rocking gang, for maximum output. Repeat 6 and 7 until no improvement can be made. This completes the alignment.

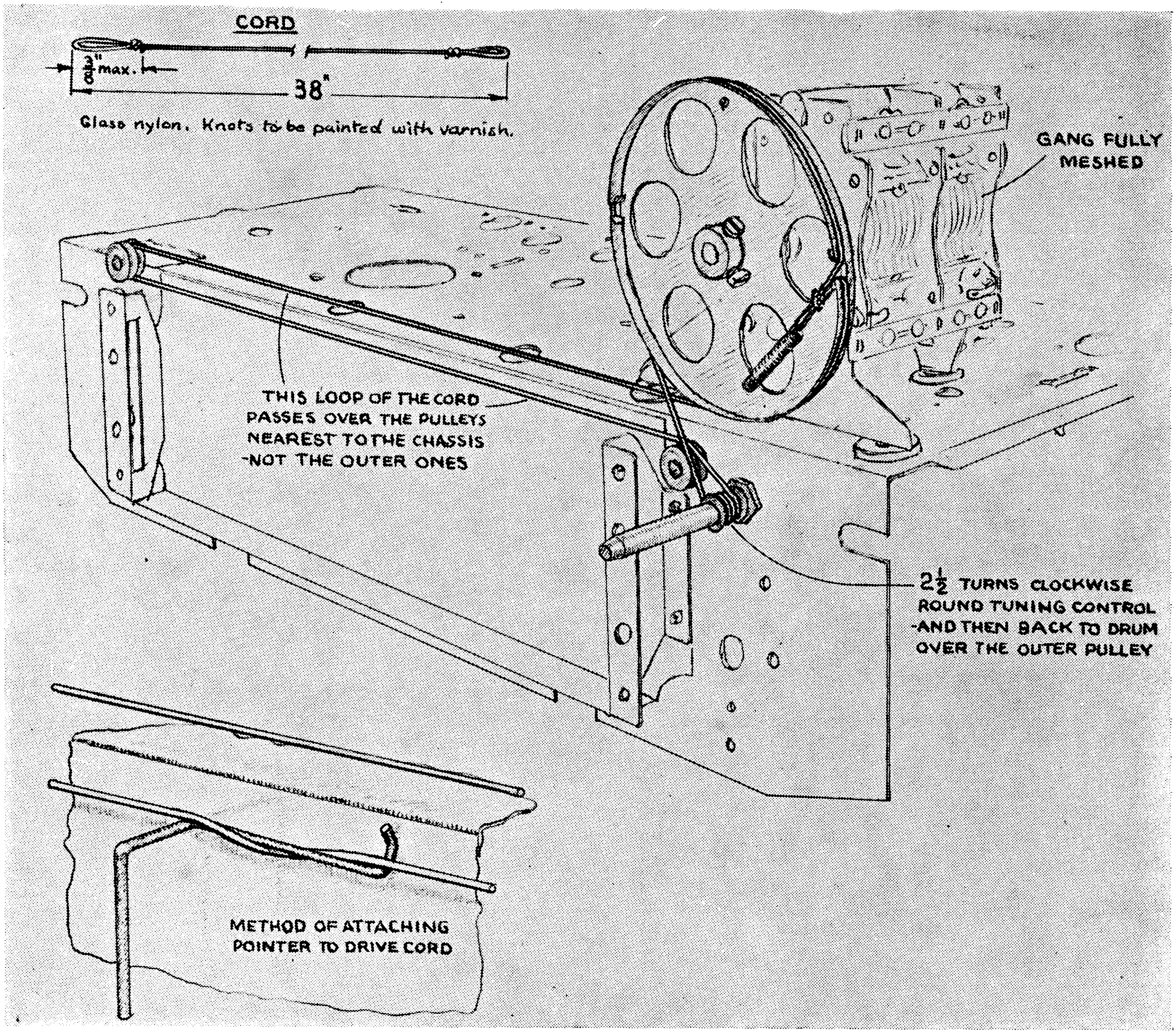
VOLTAGE READING—M.210 A.C.

All voltages D.C. and relative to chassis unless otherwise stated.
Measured on AVO.7. 400 V Range =* 10V Range =†

VALVE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
ECH 81	G2. G4. 54*	G1. —	K.G5.S. 1·2†	H —	H 6·27 AC	AH 215*	G3. —	AT 85*	G.T. —
EF 41	H —	A. 215*	I.C. —	I.C. —	G.2 70*	G1. —	K.G3.S. 1·1†	H 6·27 AC	— —
EBC 41	H —	A 95*	G —	S —	D2. —	D1. —	K 1·2†	H 6·27 AC	— —
EL 84	I.C. —	G1. —	K.G3 6·6†	H 6·27 AC	H —	I.C. —	A 270*	I.C. —	G2. 215*
EZ 80	A1. 287 AC	I.C. —	K 330*	H —	H —	I.C. —	A2. 287 AC	I.C. —	I.C. —

Voltage across C42=228*
All the above voltages taken on the 226-250v tap with an input of 238v A.C.
The following readings were taken with 250v A.C. to the 226-250v tap. Across C43=334volts.
C43 ripple peak to peak=28 volts.

DRIVE CORD FITTING AND POINTER FITTING DIAGRAM


CORD
3/8" max.
38"
Glass nylon. Knots to be painted with varnish.
GANG FULLY MESHED
THIS LOOP OF THE CORD PASSES OVER THE PULLEYS NEAREST TO THE CHASSIS -NOT THE OUTER ONES
2½ TURNS CLOCKWISE ROUND TUNING CONTROL -AND THEN BACK TO DRUM OVER THE OUTER PULLEY
METHOD OF ATTACHING POINTER TO DRIVE CORD

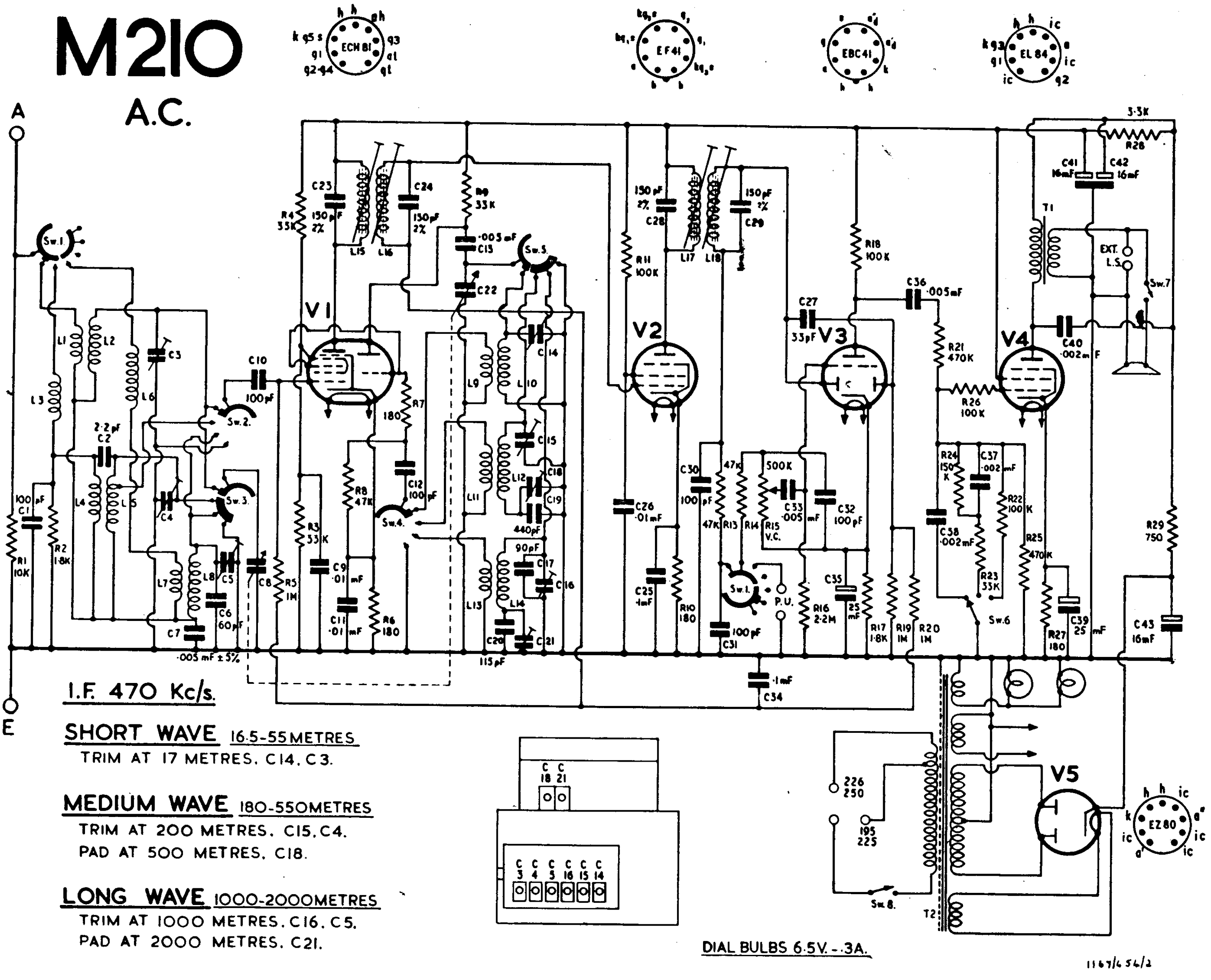
VOLTAGE READINGS M.210U A.C./D.C.

All voltages D.C. and relative to chassis unless otherwise stated.
Measured on AVO.7. 400 V Range =* 10 V Range =†

VALVE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
UCH 41	H —	AH 148 V *	AT 70 V*	G3-GT —	G2 G4 45 V*	G1 —	K 0·61 V†	H —
UF 41	H —	A 150 V*	K.S.G3 0·59 V†	K.S.G3 0·59 V†	G2 47 V*	G1 —	K 0·59 V†	H —
UBC 41	H H	AT 76 V*	GT —	S —	AD —	AD —	K 0·28 V†	H —
UL 41	H —	A 186 V*	K.G3 8·5 V†	— —	G2 149 V*	G1 —	K 8·5 V†	H —
UY 41	H 115 VA.C.*	AD 235 VA.C.*	— —	— —	— —	— —	K 240 V*	H —

Voltage Across C.42—200 V*.
Above voltages for mains input of 245 V A.C. on mains tap 236-255 V.
Electrolytic voltages measured for 250 V input on 236-255 V tap.
Peak voltage = 253 V. Peak to Peak ripple voltage = 48 V.

M210
A.C.



I.F. 470 Kc/s.

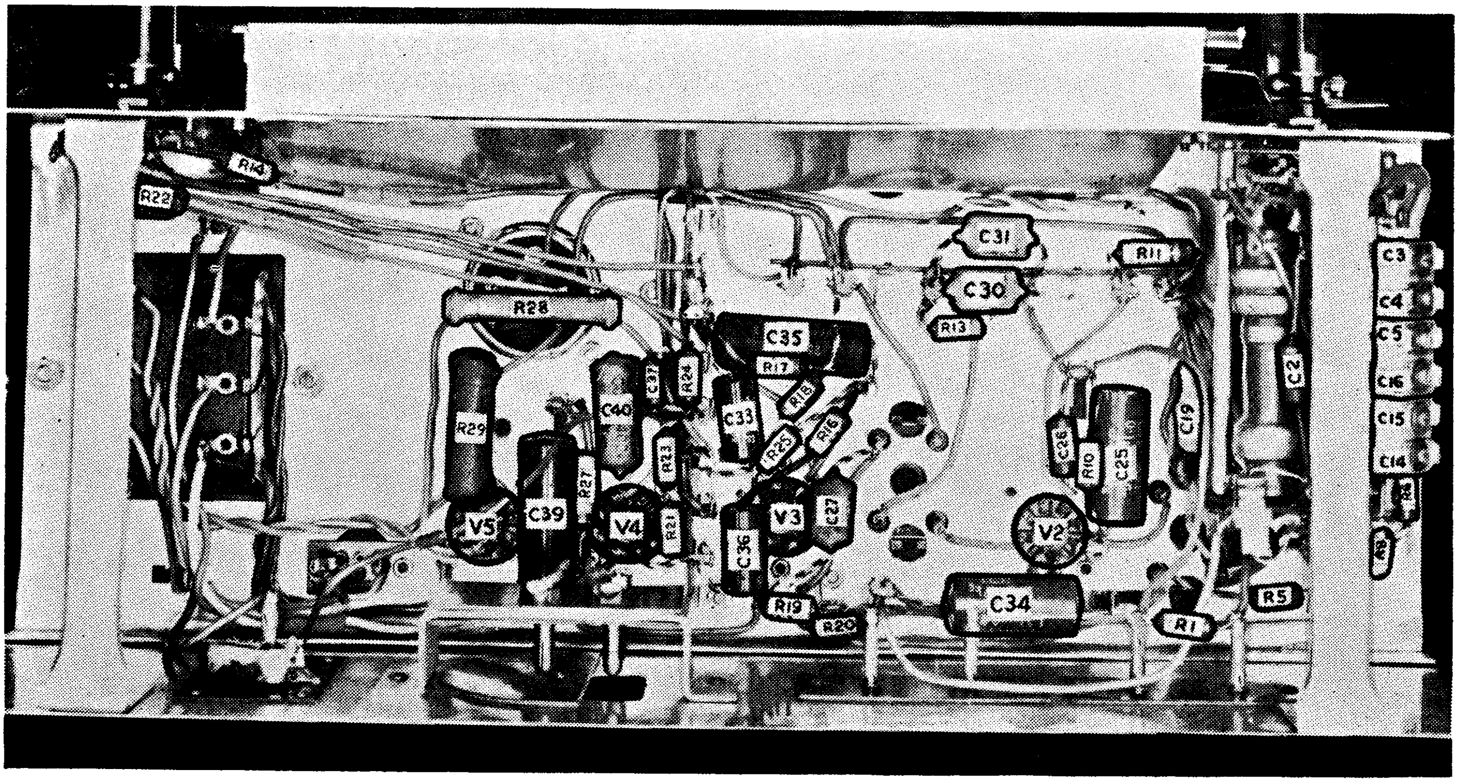
SHORT WAVE 16.5-55 METRES
TRIM AT 17 METRES. C14. C3.

MEDIUM WAVE 180-550 METRES
TRIM AT 200 METRES. C15. C4.
PAD AT 500 METRES. C18.

LONG WAVE 1000-2000 METRES
TRIM AT 1000 METRES. C16. C5.
PAD AT 2000 METRES. C21.

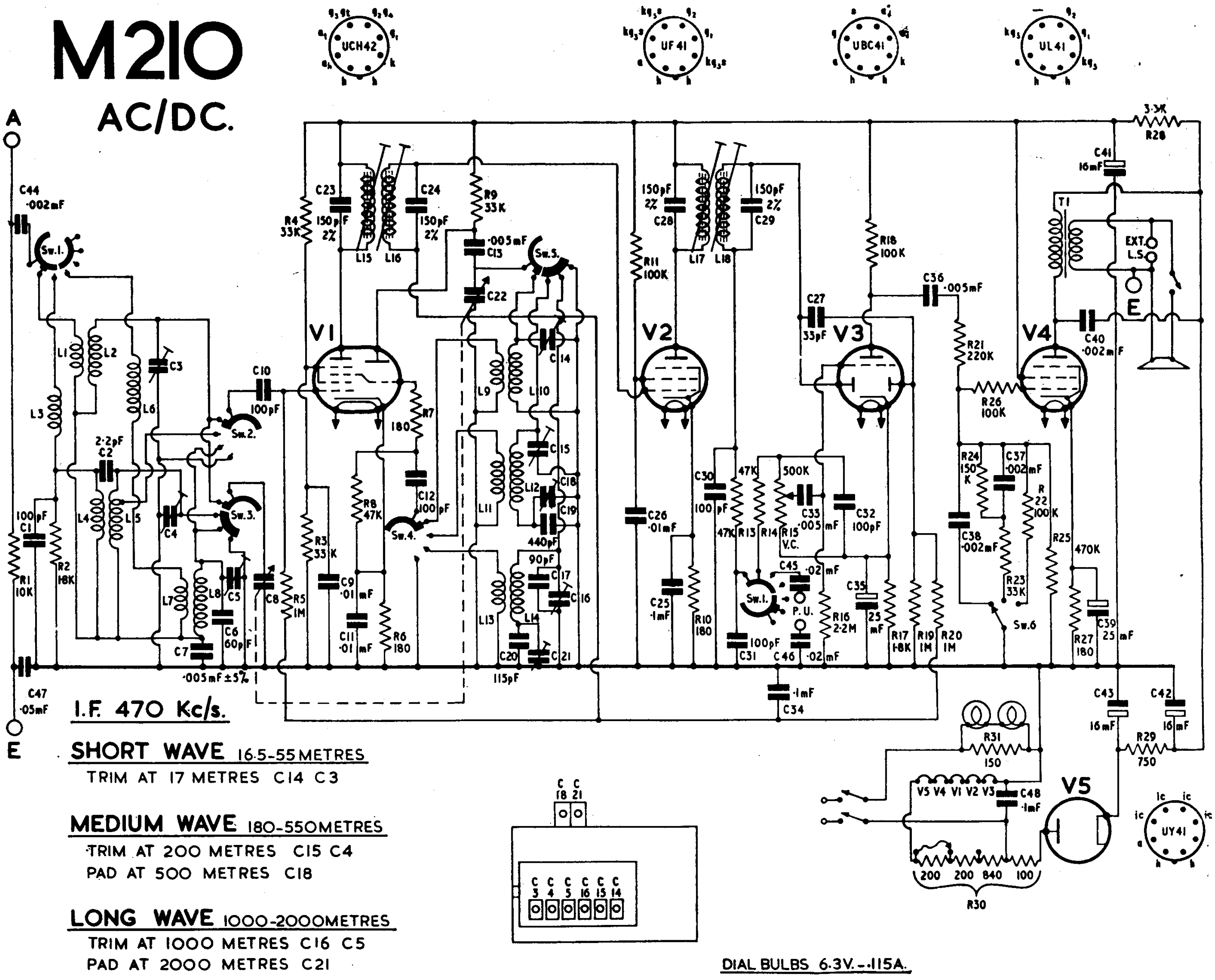
DIAL BULBS 6.5V. - .3A.

UNDER CHASSIS PHOTOGRAPH M.210 A.C.



M210

AC/DC.



I.F. 470 Kc/s.

SHORT WAVE 16·5-55 METRES
TRIM AT 17 METRES C14 C3

MEDIUM WAVE 180-550 METRES
TRIM AT 200 METRES C15 C4
PAD AT 500 METRES C18

LONG WAVE 1000-2000 METRES
TRIM AT 1000 METRES C16 C5
PAD AT 2000 METRES C21

DIAL BULBS 6·3V.-·115A.

UNDER CHASSIS PHOTOGRAPH M.210U A.C./D.C.